

REMARKS

Applicant requests that claim 10 be rewritten in independent form, including all the features of the base claim. Applicant also requests that claims 4-9 be amended to depend from claim 10. Finally, Applicant requests that claim 3 be cancelled without prejudice to or disclaimer of the subject matter therein.

Applicant respectfully requests that this Amendment under 37 C.F.R. § 1.116 be entered by the Examiner, placing claims 4-10 in condition for allowance. The proposed amendments of claims 4-10 do not raise new issues or necessitate the undertaking of any additional search of the art by the Examiner, since all of the elements and their relationships were earlier claimed and examined. Therefore, this Amendment should allow for immediate action by the Examiner.

Additionally, entry of the Amendment would place the application in better form for appeal, should the Examiner dispute the patentability of the pending claims.

Rejection under 35 U.S.C. § 103

The Examiner rejected claims 3-10 under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 6,296,780 to Yan *et al.* ("Yan"). Applicant requests that claim 3 be cancelled, and that claim 10 be rewritten in independent form. Further, Applicant requests that claims 4-9 be amended to depend from claim 10. Proposed independent claim 10 is directed to a semiconductor device comprising a substrate, and an insulating film of a fluorine-contained carbon film formed on the substrate. The surface of the insulating film is irradiated with hydrogen plasma. The semiconductor device also includes a wiring layer of copper formed on the insulating film, and an adhesion layer formed between the insulating film and the wiring layer, for preventing the wiring layer

from being peeled off from the insulating film. The adhesion layer includes a metal layer of a metal disposed adjacent the wiring layer, and a layer of a compound containing carbon and the metal disposed adjacent the insulating film.

Yan relates to an apparatus for etching an organic anti-reflective coating (OARC) layer and a titanium nitride anti-reflective coating (TiN ARC) layer deposited on a substrate located within a processing chamber. Yan discloses a substrate 100 including a base 110, made of any material, such as semiconductor, glass, ceramic, metal, or polymer. The base 110 is preferably a semiconductive wafer, such as a silicon wafer. A plurality of layers are formed on the base 110, including the following: an underlying layer 114 formed of an insulative oxide layer such as a silicon oxide layer; an overlying layer 116 forming a base diffusion barrier of titanium, tungsten, titanium-tungsten, titanium nitride, or a combination of these; a middle layer 117 forming a conductive layer of an alloy of aluminum, silicon, and copper; a titanium nitride anti-reflective coating (TiN ARC) layer 118; a top organic anti-reflective coating (OARC) layer 120, which could be a carbon containing material, such as a polymeric material; and a resist layer 122 which is resistant to etching, such as photoresist. See Yan, column 5, lines 19-52.

The OARC layer 120 and the TiN ARC layer 118 are etched with a first single stage step. This is accomplished by introducing an etchant gas into the process zone, and generating a plasma from the etchant gas. The plasma etches both the OARC and TiN ARC layers on the substrate. See Yan, column 4, lines 5-24; column 8, lines 8-10.

In the outstanding Office Action, the Examiner removed the rejection under 35 U.S.C. § 102 and rejected the claims under 35 U.S.C. § 103. However, Yan does not establish a *prima facie* case of obviousness because Yan does not teach or suggest all

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the features of proposed independent claim 10. For example, Yan does not teach or suggest an adhesion layer, as claimed in proposed claim 10. The Examiner acknowledged that Yan does not show an adhesion layer including a metal layer of a metal and layer of a compound including carbon and a metal. The Examiner alleges however, that Yan teaches an adhesion layer including a layer of a compound (TiN) containing carbon (from the etching gas) and a metal (Ti). However, there is no teaching or suggestion that the structure taught in Yan includes a metal layer of a metal disposed adjacent a wiring layer, and a layer of a compound containing carbon and the metal is disposed adjacent the insulating film.

The Examiner asserts that the claimed layer of a compound containing carbon and the metal is obvious in view of the TiN ARC layer 118 and the carbon-containing gas taught in Yan. However, in the structure taught in Yan, the carbon-containing gas cannot access the TiN ARC layer 118 to form the claimed "layer of a compound containing carbon and the metal" because the TiN ARC layer 118 is covered and protected from exposure to the gas by the OARC layer 120. Even after etching, only the edges of the TiN ARC layer 118 are exposed to any gas. Moreover, even if the edges of the TiN ARC layer 118 were to react with a carbon-containing gas to form a compound containing carbon and the metal, it would be only at the edges, and would not constitute a layer as recited in proposed claim 10.

Furthermore, proposed claim 10 recites that the adhesion layer includes "a metal layer of a metal disposed adjacent said wiring layer, and a layer of a compound containing carbon and said metal disposed adjacent said insulating film." Merely exposing the edges of the TiN ARC layer 118 taught in Yan to a carbon-containing gas

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would not result in the adhesion layer of proposed claim 10. This is because any reaction that might occur between the layer edge and the gas would occur equally across the exposed areas. Accordingly, the TiN ARC layer 118 would not include a metal layer disposed adjacent to a wiring layer and a layer of a compound containing carbon disposed adjacent to the insulating film. Furthermore, there is no teaching or suggestion in Yan to modify the structure of Yan to include the layers recited in proposed claim 10. Because Yan does not teach or suggest all the features of proposed claim 10, Yan does not render proposed claim 10 unpatentable.

The Examiner pointed Applicant's attention to MPEP § 2113 relating to product-by-process claims. MPEP § 2113 explains that "[i]f the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." (Citations omitted). However, as set forth above, the product claimed in proposed claim 10 is not the same product or a product that could be considered obvious in view of the prior art product. Because Yan does not teach or suggest all the features recited in the proposed claims, the proposed claims are allowable over Yan.

Proposed claims 4-9 depend from and add additional features to proposed independent claim 10. Accordingly, proposed claims 6-9 are allowable for at least the reasons set forth above. Applicant respectfully requests that the Examiner enter this Amendment and withdraw the rejection of claims 4-9.

Conclusion

Applicant respectfully requests the entry of this Amendment and the timely allowance of the claims.

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Please grant any extensions of time required to enter this response and charge
any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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By: 

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